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Chronic Procrastination Among Iranians: Prevalence Estimation, Latent Profile and Network Analyses

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Abstract
Procrastination is the deliberate, unjustified postponing of an intended course of action despite its costs or unfavorable effects. The present study used a self-report online survey and collected data from a large convenience sample of the general adult population ($N = 2{,}076$; females = 55.73%; $M_{age} = 35.1$ years [SD ± 12.7]) with diverse demographics. Following the ring-curve distribution, the results indicated a 15.4% prevalence rate of procrastination among the Iranian community, which was significantly higher among women and divorced individuals and lower among nomadic individuals and those with higher academic degrees. A latent profile analysis demonstrated two distinct profiles, one for procrastinators (high scores on chronic procrastination, psychological distress, neuroticism, and extraversion; and low scores on general self-efficacy, self-esteem, satisfaction with life, openness, agreeableness, and conscientiousness) and one for non-procrastinators (demonstrating a reverse pattern compared to procrastinators). Moreover, additional network analysis suggested that the examined networks were invariant across procrastination status and gender. The results indicate that procrastination differs by demographic characteristics and is associated with a unique psychological profile. However, none of the aforementioned key study variables were considered a potential vulnerability for procrastinators due to the finding that all variables were peripheral and none were central in the examined networks. Therefore, relying on the differences in mean scores on psychometric scales does not appear to be an optimal way of determining the most important variables in a therapeutic context when treating procrastination.

Keywords Procrastination · Prevalence · Latent profile analysis · Network analysis · Adults · Iran

Introduction

Although everyone procrastinates, not everyone is a procrastinator [1]. Procrastination is to voluntarily delay an intended course of action despite expecting to be worse off for the delay [2], or it is the intentional, unjustified postponement of an intended course of action despite the individual's awareness that this delay would incur costs

Extended author information available on the last page of the article

or have undesirable consequences, which may cause emotional discomfort [1, 3]). Generally, procrastination can manifest in two forms: *behavioral procrastination*, which involves the postponement of task completion or goal-oriented behavior, and *decisional procrastination*, which is characterized by difficulty in making timely decisions [4, 5]. Compared to non-procrastinators, procrastinators make frequent delays a habit and routinely put off tasks until tomorrow "without a genuine reason" [1]. The present study examined potential vulnerability towards procrastination by using the Temporal Motivation Theory (TMT) [6], as a theoretical framework. To gain insight into this issue, the study looked at various variables such as self-esteem, self-efficacy, psychological distress, life satisfaction, emotion regulation, and the Big Five personality traits.

TMT is a broad integrative theory that considers time as a critical factor in motivation, which provides a framework for understanding procrastination [7]. According to this theory, procrastination can occur when the motivation to engage in a task is low. This, in turn, depends on how much a task or choice is desirable to individuals. Individuals tend to desire positive outcomes that are close in time, likely to happen, and significant in magnitude, while negative outcomes that are distant, improbable, and trivial in magnitude are less desirable [2, 6]. In TMT, motivation (desire for a particular outcome) is a product of four factors: expectancy, value, impulsiveness, and delay. Expectancy is represented by self-efficacy or the probability of success, value is the reward associated with the desired outcome, impulsiveness is the sensitivity to delay, and delay is the time to complete a task [2].

Self-efficacy and Self-esteem

TMT suggests that various factors pertain to its four main concepts (expectancy, value, impulsiveness, and delay), which can be relevant to the issue of procrastination. Among these, the first concept of expectancy (or self-efficacy) should be considered alongside self-esteem. Self-esteem and self-efficacy are interconnected concepts that have been linked to lower levels of procrastination. Self-esteem pertains to an individual's perception and appraisal of themselves [8], whereas self-efficacy involves evaluating their capability to attain a specific objective [9]. Individuals can cultivate a sense of self-efficacy by acquiring expertise, witnessing others' accomplishments, receiving constructive feedback, or relying on physiological cues [9]. The available literature indicates that self-esteem and self-efficacy are two distinct constructs with differential impacts on an individual's cognitive and behavioral repertoire. More specifically, self-esteem is a trait-like characteristic that influences an individual's perception of their overall ability to carry out tasks, with low self-esteem leading to negative self-appraisals such as "*I am incompetent and incapable of succeeding*."

Conversely, self-efficacy is better understood as a state-like construct that affects an individual's behavior when confronted with a challenging task, contingent upon their perception of their capability to achieve the desired outcome. The TMT posits that individuals with lower levels of self-efficacy and self-esteem are more likely to engage in procrastination behaviors [2]. In light of this, the present study aimed to investigate whether self-efficacy and self-esteem could be used as differentiating factors between individuals who engage in procrastination behaviors and those who do not.

Psychological Distress and Life Satisfaction

The concept of 'value' constitutes the second dimension of TMT and is a multidimensional construct that encompasses the unpleasantness of a task, the pleasure derived from task accomplishment, and the degree of tiresomeness associated with the task [2]. This construct is typically reflected in the level of distress experienced during task performance and the degree of satisfaction upon task completion. According to TMT, procrastinators tend to view most of their life duties as aversive and, as such, are likelier to experience aversion toward task completion [10]. Also, research suggests that that procrastination is positively correlated with an inability to enjoy satisfaction even after satisfactory performance [11]. In contrast, non-procrastinators tend to derive pleasure from task completion and experience higher levels of life satisfaction.

Psychological distress includes a range of non-specific symptoms associated with stress, anxiety, and depression [12]. On the other hand, life satisfaction is a cognitive and global evaluation of an individual's overall quality of life [13]. According to El-Monshed et al. [14], there is a negative association between psychological distress and life satisfaction, suggesting that higher levels of psychological distress can lead to lower life satisfaction (or vice-versa). Additionally, research by Maria-Ioanna and Patra [15] has shown that procrastination is positively associated with psychological distress and negatively associated with life satisfaction. This means that procrastinating individuals may experience higher levels of psychological distress, which can negatively impact their overall life satisfaction. In light of this, the present study investigated whether psychological distress and life satisfaction were differentiating factors between individuals who engage in procrastination behaviors and those who do not.

Big Five Personality Traits

In the context of TMT, 'delaying' refers to postponing a task. Personality traits and individual differences can influence an individual's tendency to delay tasks [2]. This is the third concept of TMT covered in the present study. According to Steel [2], neuroticism is considered a source of procrastination and is associated with worry, anxiety, and negative affect. In addition, individuals with high anxiety levels tend to catastrophize even minor events, leading to avoidance of important tasks and responsibilities. TMT views procrastination as a representation of low conscientiousness because individuals who are less responsible and committed tend to delay tasks.

Additionally, it suggests that individuals with lower levels of agreeableness may procrastinate due to their rebellious and hostile nature. However, TMT does not have a clear stance on the relationship between extraversion and procrastination, as it can be difficult to explain how extraversion affects procrastination, suggesting a need for further investigation. According to Steel [2], openness to experience is the only trait in the Big Five model that does not affect procrastination, given its association with cultural awareness, intellect, and the need for cognition. However, the present study examined it in relation to procrastination as part of the Big Five personality traits. It is important to note that TMT [2] emphasizes neuroticism and conscientiousness because of their conceptual links to procrastination. However, it provides a rationale for why individual differences should be considered, as they could affect an individual's sensitivity to delay.

Ocansey et al. [16] reported that all Big Five personality traits had an association with procrastination. All traits, except neuroticism, were negatively associated with procrastination. This means that higher levels of neuroticism were associated with higher levels of procrastination, while the opposite was true for the relationship between the other Big Five traits and procrastination. In light of this, the present study investigated whether the Big Five personality traits could be used as differentiating factors between individuals who engage in procrastination behaviors and those who do not.

The Present Study

The present study was exploratory. Therefore, there were no specific hypotheses, it aimed to answer three main questions. These three research questions (RQs) are outlined below, each following the relevant literature in relation to each RQ.

Prevalence of Procrastination Among Iranians The first objective was to determine the prevalence of procrastination among a convenience sample of the Iranian general population (non-students). Chronic procrastination affects approximately 15%-20% of adults [1, 4, 17], and approximately 25% of adults view procrastination as a defining trait of their personality [18]. These statistics suggest that procrastination is a prevalent behavior among adults. However, studies undertaken in Iran have focused solely on the prevalence of procrastination among college students considering delaying academic tasks, with the prevalence ranging from 31% [19] to 70% [20], and have not examined procrastination among general or community samples. Therefore, the present study asked: what is the prevalence of procrastination among Iranians, and does it differ across different demographic features? (RQ1).

Latent Profiles of Iranian Procrastinators The second objective was to profile procrastinators and non-procrastinators using latent profile analysis based on the previously discussed variables. This is important given that comparing procrastinators versus non-procrastinators could provide insights into its psychopathology [21, 22]. Previous research has demonstrated that individuals who seek treatment for procrastination can be distinguished into five separate subgroups, or clusters, of procrastinators: 'mild procrastinators,' 'average procrastinators,' 'well-adjusted procrastinators,' 'severe procrastinators,' and 'primarily depressed' [23]. Also, comparing 'less severe procrastinators' versus 'severe procrastinators' showed that the latter experienced more problems of procrastination in different life domains, greater symptoms of psychological distress (stress, anxiety, and depression), and lower quality of life [24]. A longitudinal study of twins showed that genetic factors explained 46% of the variance for procrastination, meaning that a greater variance was explained by non-genetic factors [22]. Consequently, the study of psychological factors is warranted. However, to date, no known research has utilized the specific variables used in the present study (i.e., self-efficacy, self-esteem, psychological distress, life satisfaction, emotion regulation, and the Big Five personality traits) to distinguish individuals who exhibit procrastination tendencies. Such a profile analysis might assist clinicians in targeting a variable for psychotherapy from an Iranian sample outside of Western, Educated, Industrialized, Rich, and Democratic (WEIRD) samples [25]. Therefore, the present study asked: can the variables of interest (self-efficacy, self-esteem, psychological distress, life satisfaction, emotion regulation, and the Big Five personality traits) be used to create profiles to distinguish procrastinators from non-procrastinators? (RQ2).

Network Analysis of Iranian Procrastinators The third objective was to use network analysis to explore whether there are central variables (i.e., the smaller the number of shortest paths between a variable and all the other variables in the network, the more central the variable is) that could provide insight into the differences between procrastinators and non-procrastinators. To the best of the authors' knowledge, no previous study has ever used network analysis in studying procrastination. Such analysis would provide the basis for future studies on procrastination by highlighting variables for potential comparisons and distinctions that may be attributable to cultural and ethnic characteristics. Therefore, the present study asked: is there a key (central) variable that relates to procrastination when considering other variables simultaneously? (RQ3).

To the best of the authors' knowledge, the present study is the first to estimate the prevalence of procrastination among non-student samples of Irian adults. The present study uniquely combined latent profile analysis and network analysis, which are not commonly applied simultaneously in studying procrastination except for one study examining academic procrastination, which used both approaches [26]. However, their study did not investigate procrastination among the general population. Moreover, the study only focused on academic procrastination and perceived stress, and not the variables studied in the present study. Latent profile analysis helps identify unobserved subgroups (latent profiles) and distinguishes between different types of individuals by providing insight regarding different procrastination patterns based on the aforementioned set of variables. While latent profile analysis focuses on individuals, network analysis focuses on the dynamic and interconnection of the variables contributing to distinct profiles. This dual approach facilitates a more holistic view to provide a bigger picture of procrastination by simultaneously considering individual differences and interconnections of the variables.

Method

Participants

With the requisite confidence interval (95%), targeted estimates (20%), and desired precision of estimate (0.02), at least 1,537 participants were deemed necessary to explore the prevalence of procrastination among a convenience sample of the Iranian adult general population using *Epitools* [27]. The final sample satisfied these requirements, given that it comprised 2,076 adult participants.

Measures

Demographic Items Participants completed self-report items including demographic variables that were used as secondary outcome measures: age, gender (male/female), marital status (single/married/divorced), educational attainment (high school, diploma; bachelor's degree, master's degree, PhD or higher), number of family members (low [three or below], average [four to six], high [above six]), where they lived (rural areas, large cities, small cities, or no fixed place [i.e., nomadic]), income level (as converted into US dollars), and occupational status (self-employed, government employee, private sector

employee, farmer/rancher, unemployed). It should be noted that all measures were used in Persian/Farsi.

Behavioral Procrastination The 15-item Adult Inventory of Procrastination (AIP; [28]; Persian version: [29]) was used to assess the behavioral tendency to put off the beginning and/or the completion of tasks. Items (e.g., "*I often find myself running later than I would like to be*") are rated on a seven-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*). Scores range from 15 to 120, and higher scores indicate higher behavioral procrastination. In the present study, the internal consistency was very good (McDonald's omega = 0.80).

Decisional Procrastination The five-item Decisional Procrastination Scale ([30], Persian version: [31]) was used to assess the tendency to put off decisions. Items (e.g., "*I delay making decisions until it is too late*") are rated on a five-point Likert scale (1 = *Does not apply to me*; 5 = *Totally applies to me*). Scores range from 5 to 25, and higher scores indicate higher decisional procrastination. In the present study, the internal consistency was very good (McDonald's omega = 0.88).

Dysfunctional Procrastination In line with the common practice and given that behavioral and decisional procrastination are two components of procrastination [4, 5], the authors constructed a 'dysfunctional procrastination' as a composite variable (i.e., with simple averaging; for more information, please see, [32]) of both behavioral and decisional procrastination.

General Self-efficacy The 17-item General Self-Efficacy (Scale [33], Persian version: [34]) was used to assess self-efficacy in general situations. Items (e.g., "*When I make plans, I am certain I can make them work*") are scored on a five-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*). Scores range from 17 to 85, and higher scores indicate higher self-efficacy. In the present study, the internal consistency was excellent (McDonald's omega = 0.92).

Self-esteem The 10-item Rosenberg Self-esteem Scale ([35]; Persian version: [36]) was used to assess self-esteem. The scoring for each scale item (e.g., "*I feel that I'm a person of worth, at least on an equal plane with others*") might be positive (1) or negative (-1). Scores range from -10 to + 10, and higher positive scores indicate higher self-esteem. In the present study, the internal consistency was very good (McDonald's omega = 0.85).

Satisfaction with life The five-item Satisfaction with Life Scale ([37]; Persian version: [38]) was used to assess life satisfaction. Items (e.g., "*If I could live my life over, I would change almost nothing*") are scored on a five-point Likert scale (1 = *Strongly disagree*, 7 = *Strongly agree*). Scores range from 5 to 35, and higher scores indicate higher life satisfaction. In the present study, the internal consistency was very good (McDonald's omega = 0.86).

Psychological Distress The 21-item Depression Anxiety Stress Scale ([39], Persian version: [40]) was used to assess psychological distress. The scoring is based on a 4-Likert point scale. Items (e.g., *"I was intolerant of anything that kept me from getting on with what I was doing"*) are scored on a four-point Likert scale (0 = *Never*, 3 = *Always*). Scores range from 0 to 63, and higher scores indicate higher psychological distress. In the present study, the internal consistency was excellent (McDonald's omega = 0.91).

Big Five Personality Traits Five two-item dimensions were rated on the 10-item short version of the Big Five Inventory ([41], Persian version: [42]) to assess the Big Five personality traits comprising neuroticism, extroversion, agreeableness, openness, and conscientiousness. Items are scored using a five-point Likert scale (1 = *Totally disagree*, 5 = *Totally agree*). Scores for each trait range from 2 to 10, and the higher the score, the higher the given trait. In the present study, the internal consistency was good (McDonald's omega = 0.74).

Procedure

The present study conformed to the Declaration of Helsinki, and the procedure was approved by the ethics committee of the first author's university. Data were collected in Iran using convenience sampling between January and July 2022. Participants were recruited through online advertisements on social media platforms (i.e., *Telegram, WhatsApp, Instagram, Facebook,* and *Twitter*). The general inclusion criteria included being 18 years and older, having Iranian residency, and being proficient and literate in Persian.

All participants were notified that the survey focused on procrastination and related topics and that the self-reported data collection would last no more than 30 min. In addition, confidentiality was ensured, and informed consent was acquired. The survey was administered via an online link. All participants completed a demographic questionnaire, followed by the psychometric scales and directions for completion. To submit the online survey, all questions needed to be answered, therefore, there were no missing data. All participants were volunteers, receiving no compensation.

Data Analysis

Data processing and diagnostics procedures were conducted using *SPSS version 26* and the data normality assumption was determined using a skewness of ± 2 and kurtosis of ± 7 [43]. After establishing that the distribution was normal, data were analyzed for outliers using the Mahalanobis distance, which did not identify any influential outliers.

Prevalence Estimation The analysis used the method of identifying procrastinators from the sample based on the previous process [1, 44–47]. Briefly, standardized *z*-scores were considered when calculating procrastination prevalence across the entire sample. Accordingly, a z-score of 1.04 was the cut-off for procrastination (85% probability) and -1.04 for non-procrastination. This procedure followed the ring-curve distribution (like IQ distribution). Z-scores between -1 and + 1 are considered average, while scores of one or more standard deviations from the mean are considered above or below the average. Consequently, those individuals who scored ≥ 1 S.D. on procrastination were deemed 'procrastinators,' and those who scored ≤ 1 S.D. on procrastination were deemed 'non-procrastinators.' The prevalence of procrastination across various characteristics then was investigated.

Latent Profile Analysis The analysis determined the number of classes into 10-class solutions to see which class would fit the data better. The three-class solution outperformed the other solution given the high entropy (> 0.80), significant BLRT, and 90%-93% confidence in classifying participants into three classes, according to the posterior probabilities.

Network Analysis Network analysis (NA) was conducted using *JASP* ([48]; jasp-stats.org), and *R version 4.2.2* was used to compare networks across gender and procrastination status (i.e., procrastinators vs. non-procrastinators). Using NA, the associations between several constructs could be visualized while controlling for all other variables in the network [49]. In each network analysis, there are nodes and edges. A node represents an included variable in the network, while an edge indicates the connection or interconnectivity between the nodes.

To create the network, a graphical least absolute shrinkage and selection operator (LASSO) regularization method was used based on the Extended Bayesian Information Criterion (EBIC). This approach can help to decrease false positive connections and control spurious associations in the network. The tuning parameter was set at 0.5 to control the complexity of the model and prevent overfitting or underfitting. To quantify the importance of each node in the network, expected influence (EI), betweenness, closeness, and strength were calculated. EI can measure the influence of a node on the other nodes in the network.

Betweenness is a measure of a node's centrality and reflects the number of shortest paths between that node and all the other nodes in the network. Closeness, on the other hand, measures the degree of distance of a node to all other nodes in the network. Strength is a measure of the magnitude of the connections between a node with all other nodes in the network. A bootstrapping method was used with 1000 iterations to estimate the stability of the edges. The Network Comparison Test (NCT) was used to compare the network structures across gender and procrastination status.

Results

Demographic Features

Of the 2,076 adult participants ($M_{age} = 35.1$ years, $SD = 12.7$), 55.73% were female, 63.35% were from families with 4 to 6 members, 70% lived in metropolitan regions, and the remaining individuals were nomadic or lived in rural areas. Among the participants, 60% had a university degree, while the others were educated at a non-academic level. Nearly 80% of the participants were employed, and 54% were married. Finally, 83% had monthly incomes equal to or below 240 US dollars.

Prevalence of Procrastination Among Iranians

According to Table 1, across the total sample (N = 2,076), 15.4% were categorized as procrastinators (n = 319; 198 females and 121 males). However, prevalence rates varied according to demographic characteristics. For instance, the prevalence of procrastination among females was significantly higher than among males. Based on where they lived, the lowest prevalence belonged to nomadic individuals (9%), while there were no significant differences in the prevalence of procrastination among those living in rural areas, small or large cities ($\chi^2 = 4.41$, $df = 2$, $p = 0.110$). In relation to educational attainment, the lowest prevalence belonged to individuals who held PhDs or higher (9%), while there were no significant differences in procrastination between individuals who had other academic degrees or below ($\chi^2 = 6.52$, $df = 3$, $p = 0.090$). In relation to marital status, the highest prevalence of procrastination was among divorced individuals (23%), while there were no significant

Table 1 Procrastination prevalence across different demographic features (N = 2,076)

Category	Variable	*n*	Procrastinators %	Prevalence differences (χ^2, *df*) = *p*-value
Gender	Male	919	13%	(6.10, 1) = 0.01
	Female	1157	17%	
Family population	Low (2–3)	530	14%	(3.39, 2) = 0.18
	Average (4–6)	1336	15%	
	High (≥ 6)	210	19%	
Living area	Nomadic	168	9%	(8.32, 3) = 0.04
	Rural area	437	16%	
	Large cities	828	14%	
	Small cities	643	18%	
Educational attainment	High school	223	13%	(11.1, 4) = 0.02
	Diploma	617	14%	
	Bachelor degree	831	18%	
	Master's degree	300	14%	
	PhD or higher	105	9%	
Occupational status	Self-employed	481	16%	(6.29, 4) = 0.17
	Government employee	250	18%	
	Private sector employee	485	14%	
	Farmer/Rancher	429	13%	
	Unemployed	431	18%	
Income level	Less than 70$	479	18%	(5.83, 4) = 0.21
	71$ to 140$	531	15%	
	141$ to 240$	700	15%	
	241$ to 360$	164	16%	
	More than 361$	202	11%	
Marital status	Single	830	14%	(5.01, 2) = 0.05
	Married	1136	15%	
	Divorced	110	23%	

differences among single or married individuals ($\chi^2 = 0.377$, $df = 1$, $p = 0.539$). There were no significant differences in the prevalence of procrastination in relation to the number of family members, occupational status, or income level.

Further analysis compared the variables of interest's mean scores across individuals based on procrastination status (procrastinators vs. non-procrastinators) and gender status (male vs. female). The information in Table 2 shows the average scores of different variables based on whether the participant was a procrastinator or not and their gender. Procrastinators scored significantly higher than non-procrastinators on psychological distress, neuroticism, and extraversion. On the other hand, procrastinators scored significantly lower than non-procrastinators on self-efficacy, self-esteem, life satisfaction, openness, agreeableness, and conscientiousness. The average age of procrastinators was significantly lower than that of non-procrastinators.

Regarding gender, males scored significantly higher than females on self-efficacy, self-esteem, and extraversion. On the other hand, males scored significantly lower than females on psychological distress and neuroticism. However, there was no significant difference

Table 2 Mean and standard deviations of the variables of interest across procrastination and gender status

Variable	Procrastination status		differences	Gender		differences
	Procrastinators (n = 319)	Non-procrastinators (n = 322)	Welch's t (df) = p-value	Male (n = 919)	Female (n = 1157)	Welch's t (df) = p-value
Age	33.8 (11.6)	36.6 (13.4)	-2.79 (628) = 0.01	34.3 (11.2)	35.8 (13.7)	-2.63 (2072) = 0.01
Procrastination	18.3 (0.97)	12 (0.88)	86.32 (632) = 0.01	15.1 (1.98)	15.2 (2.14)	-1.10 (2072) = 0.26
General self-efficacy	45.7 (11.7)	63.8 (10.3)	-20.85 (627) = 0.01	56.5 (12.3)	53.9 (12.1)	4.82 (1956) = 0.01
Self-esteem	-2.94 (5)	4.6 (4.9)	-19.23 (638) = 0.01	2.03 (5.77)	0.52 (5.95)	5.85 (1994) = 0.01
Psychological distress	40 (10.9)	21.2 (10.9)	21.75, (639) = 0.01	27.2 (12.3)	31 (12.3)	-7.05 (1972) = 0.01
Life satisfaction	13.6 (6.1)	20 (6.6)	-12.62 (636) = 0.01	17 (6.39)	16.6 (6.49)	1.49 (1682) = 0.13
Neuroticism	8.2 (1.9)	5.5 (2.3)	16 (618) = 0.01	6.41 (2.33)	7.22 (2.35)	-7.85 (1974) = 0.01
Extraversion	7 (2.37)	6 (2.17)	5.49 (633) = 0.01	6.78 (2.19)	6.48 (2.30)	(3.04, 2008) = 0.01
Openness	7.5 (2.05)	8.1 (1.87)	-3.71 (633) = 0.01	7.68 (1.91)	7.78 (2)	(-1.13, 2004) = 0.25
Agreeableness	5.7 (2.06)	6.2 (1.93)	-3.1 (635) = 0.01	6.18 (1.85)	6.03 (2.04)	(1.81, 2036) = 0.07
Conscientiousness	5.2 (2.23)	6.6 (2.07)	-8.18 (635) = 0.01	5.90 (2.08)	5.87 (2.17)	(0.313, 2001) = 0.75

Table 3 Correlation between variables of interest (N = 2,076).

Variables	1	2	3	4	5	6	7	8	9	10
Procrastination (1)	-									
General self-efficacy (2)	-.48**	-								
Self-esteem (3)	-.41**	.64**	-							
Psychological distress (4)	.48**	-.57**	-.67**	-						
Life satisfaction (5)	-.29**	.46**	.60**	-.53**	-					
Neuroticism (6)	.35**	-.44**	-.44**	.58**	-.30**	-				
Extraversion (7)	.14**	.14**	.22**	-.18**	-.20**	-.07**	-			
Openness (8)	-.09**	.09**	.09**	-.05*	.05*	-.09**	.05**	-		
Agreeableness (9)	-.08**	.08**	.13**	-.22**	.15**	-.15**	-.15**	.01	-	
Conscientiousness (10)	-.20**	.59**	.44**	-.34**	.33**	-.22**	-.10**	.02	.01	-

** < .01; * < .05

between males and females in the level of procrastination, life satisfaction, openness, agreeableness, and conscientiousness. The average age of males was significantly lower than that of females.

Given that the mean age varied significantly between procrastinators and non-procrastinators, and between males and females, further analysis examined the potential correlation between age and procrastination scores in the aforementioned groups. In relation to procrastination status, age did not significantly correlate with procrastination among procrastinators (r[317] = -0.053, p = 0.346) or non-procrastinators (r[320] = -0.025, p = 0.652). Moreover, in relation to gender, age did not significantly correlate with procrastination (r[917] = -0.027, p = 0.420) among males. However, among females, age was negatively and significantly correlated with procrastination (r[1155] = -0.065, p = 0.026), albeit with a small effect size.

Table 3 provides the correlations between the key study variables. Procrastination was significantly and positively associated with psychological distress, neuroticism, and extraversion. On the other hand, procrastination was negatively associated with self-efficacy, self-esteem, life satisfaction, openness, agreeableness, and conscientiousness. In terms of magnitude, the association of procrastination with the variables was small (openness and agreeableness), medium (extraversion), and large (self-efficacy, self-esteem, psychological distress, life satisfaction, and neuroticism).

Table 4 Class comparison for the total sample, fit indices for the latent profile analysis

Class	LogLik	AIC	AWE	BIC	CAIC	CLC	KIC	SABIC	ICL	Entropy
1	-29452	58944	59268	59057	59077	58906	58967	58994	-59057	1.000
2	-27278	54618	55121	54793	54824	54558	54652	54695	-55000	0.852
3	-26742	53568	54250	53805	53847	53485	53613	53671	-54243	0.807
4	-26608	53322	54183	53620	53673	53217	53378	53452	-54260	0.778
5	-26419	52966	54006	53327	53391	52839	53033	53123	-54034	0.781
6	-26382	52913	54133	53336	53411	52765	52991	53098	-54213	0.761
7	-26231	52633	54031	53118	53204	52463	52722	52845	-54049	0.767
8	-26174	52542	54120	53089	53186	52350	52642	52781	-54139	0.757
9	-26126	52468	54224	53076	53184	52253	52579	52733	-54230	0.743
10	-26079	52395	54331	53066	53185	52159	52517	52688	-54293	0.739

Latent Profile Analysis of Iranian Procrastinators

To investigate the present study's second research question (i.e., can the variables of interest [self-efficacy, self-esteem, psychological distress, life satisfaction, emotion regulation, and the Big Five personality traits] be used to create profiles to distinguish procrastinators from non-procrastinators?), latent profile analysis was conducted. Table 4 shows the fit indices for the class comparison using the total sample when all variables were included in the analysis. Given that all the variables were converted into standardized *Z*-scores, each variable in Table 5 could be interpreted as how much it is higher or lower than the mean score of the total sample (0). Therefore, hereafter, a low or high score means lower than the mean or higher than the mean.

The scores for Profile 1 (n = 930) were not significantly different from the mean scores of the total sample (0); this group was classified as 'moderate procrastinators.' This profile represents individuals whose *z*-scores were near zero, indicating they did not exhibit either procrastinating or non-procrastinating behavior. However, Profile 2 (n = 570) and Profile 3 (n = 576) demonstrated different patterns. Profile 2 participants were classified as 'procrastinators' given their high scores on procrastination. The demographic features for Profile 2 were as follows: gender (65% female), marital status (44.2% single, 50.2% married, 5.6% divorced), educational attainment (11.1% high school, 32.6% diploma, 42.1% bachelor degree, 11.6% master's degree, 2.6% PhD and higher), job status (22.3% self-employed, 8.8% government employee, 21.6% private sector employee, 16.7% farmer or rancher, 30.7% unemployed), income level (31.8% less than $70, 29.8% $70-$140, 30.2% $140-$240, 4% $240-$360, 4.2% more than $360). Those in Profile 2 had (i) high scores on psychological distress, neuroticism, and extraversion and (ii) low scores on general self-efficacy, self-esteem, life satisfaction, openness, agreeableness, and conscientiousness.

Profile 3 participants were classified as 'non-procrastinators' given their low scores on chronic procrastination. The demographic features for Profile 3 were as follows:

Table 5 Latent profile analysis, three-class solution model (N = 2,076)

Variables	Profile 1 (Regular participants[a])		Profile 2 (Procrastinators)		Profile 3 (Non-procrastinators)	
	M	SD	M	SD	M	SD
Procrastination	-.02	.87	.71	.89	-.67	.79
General self-efficacy	.05	.66	-1.02	.77	.92	.61
Self-esteem	.04	.63	-1.17	.50	1.08	.39
Psychological distress	-.008	.63	1.05	.68	-1.02	.58
Life satisfaction	-.024	.78	-.85	.69	.88	.79
Neuroticism	.050	.86	.74	.66	-.82	.85
Extraversion	-.047	.98	.34	.99	-.26	.92
Openness	-.016	.99	-.11	1.03	.13	.95
Agreeableness	.032	.95	-.27	1.04	.22	.96
Conscientiousness	-.019	.87	-.66	.88	.68	.82

The mean scores are represented by z-scores; the negative sign means below the mean score of the total sample, and the positive sign means above the mean of the total sample

[a]This profile represents individuals whose z-scores are near zero, indicating they do not exhibit either procrastinating or non-procrastinating behavior

gender (50.2% female), marital status (33% single, 61.6% married, 5.4% divorced), educational attainment (10.6% high school, 26.9% diploma, 37% bachelor degree, 17.7% master's degree, 5.2% PhD and higher), job status (23.6% self-employed, 16% government employee, 23.6% private sector employee, 22.6% farmer or rancher, 14.2% unemployed), income level (15.1% less than $70, 23.6% $70-$140, 31.6% $140-$240, 11.8% $240-$360, 17.9% more than 360). Those in Profile 3 had a reverse pattern from those in Profile 2.

Network Analysis of Iranian Procrastinators

To investigate the present study's final research question (i.e., is there a key [central] variable that relates to procrastination when considering other variables simultaneously), network analysis was conducted. The results of the network analysis among 641 participants derived from latent profile analysis (i.e., 319 procrastinators and 322 non-procrastinators)

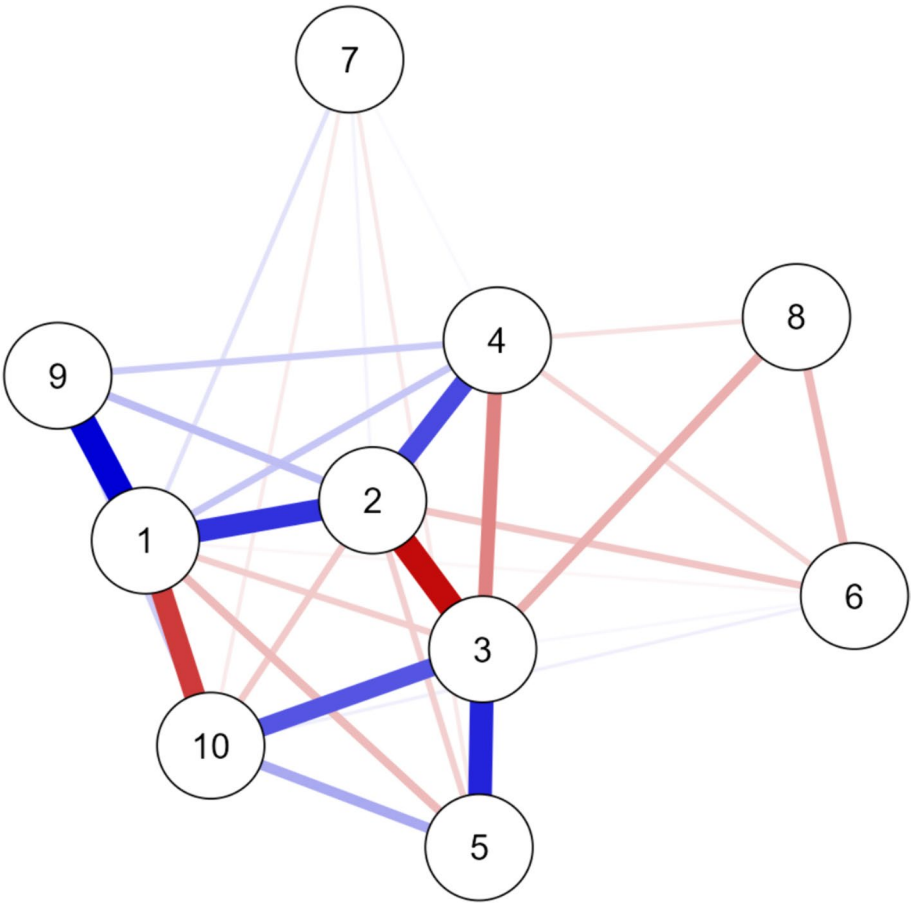

Fig. 1 EBICglasso model based on network analysis (N = 641). *Note*. 1 = Self-efficacy, 2 = Self-esteem, 3 = Psychological distress, 4 = Life satisfaction, 5 = Neuroticism, 6 = Extraversion, 7 = Openness, 8 = Agreeableness, 9 = Conscientiousness, 10 = Chronic procrastination

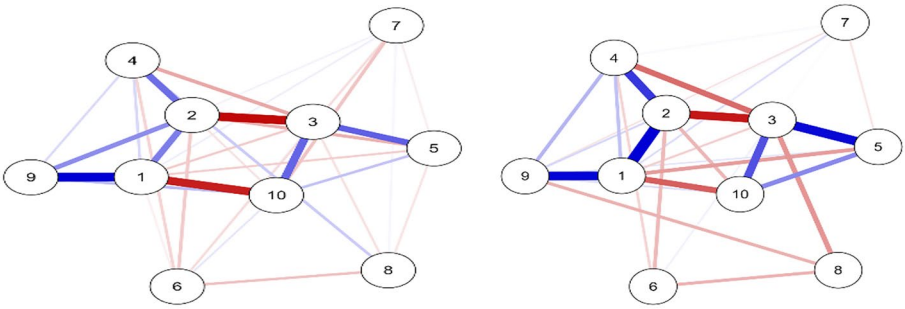

Fig. 2 EBICglasso model based on network analysis between male (left network) and female (right network). *Note*. 1 = Self-efficacy, 2 = Self-esteem, 3 = Psychological distress, 4 = Life satisfaction, 5 = Neuroticism, 6 = Extraversion, 7 = Openness, 8 = Agreeableness, 9 = Conscientiousness, 10 = Chronic procrastination

are shown in Fig. 1. As shown in Fig. 1, the network consisted of 10 nodes, including self-efficacy, self-esteem, psychological distress, life satisfaction, neuroticism, extraversion, openness, agreeableness, conscientiousness, and chronic procrastination. A total of 31 non-zero edges were found in the network, resulting in a sparsity of 0.311.

The nodes of self-efficacy and conscientiousness had high edge intensity ($r = 0.35$), whereas the node of chronic procrastination had a strong negative edge intensity with self-efficacy ($r = -0.27$), a moderate negative intensity with self-esteem ($r = -0.07$), and a weak positive intensity with neuroticism ($r = 0.12$). Additionally, the node of neuroticism had a positive edge intensity with psychological distress ($r = 0.30$) (see Appendix S1). The betweenness, closeness, strength, and expected influence for each variable in the network are shown in Appendices S2 to S6. The highest strength centrality measure was found for the node of psychological distress (1.304), while the lowest strength measure was for life satisfaction (-0.094).

The network comparison across gender groups is shown in Fig. 2. The male network had a sparsity of 0.289, with 32 non-zero edges out of 45 possible edges. The female network had a sparsity of 0.311, with 31 non-zero edges out of 45 possible edges. The results of the NCT indicated that there were no significant differences in network structure across gender groups ($p = 0.439$). Additionally, there were no significant gender differences in

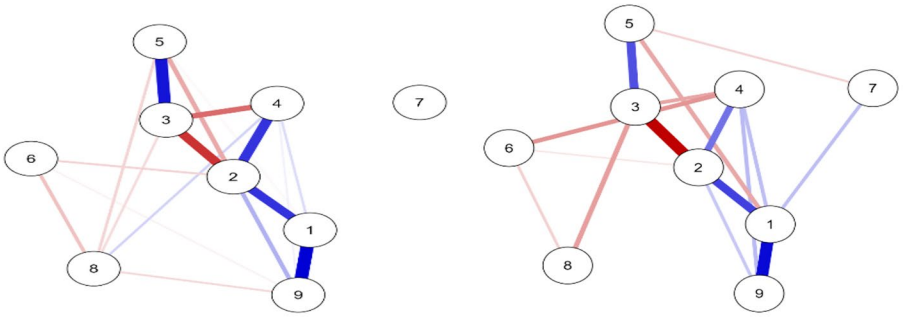

Fig. 3 EBICglasso model based on network analysis between 319 procrastinators (left network) and 322 non-procrastinators (right network). *Note*. 1 = Self-efficacy, 2 = Self-esteem, 3 = Psychological distress, 4 = Life satisfaction, 5 = Neuroticism, 6 = Extraversion, 7 = Openness, 8 = Agreeableness, 9 = Conscientiousness

global strengths ($p = 0.665$). The network indices along with edge intensity are shown in Appendices S7 to S11.

Figure 3 shows a comparison of the networks based on procrastination status. In the procrastinators' network, there were 19 non-zero edges out of 36 possible edges; in the non-procrastinators' network, there were 17 non-zero edges out of 36 possible edges. The sparsity of the procrastinators' network was 0.472, while that of the non-procrastinators' network was 0.528. The nodes of psychological distress and neuroticism had the highest edge intensity ($r = 0.31$) among procrastinators, while psychological distress and self-esteem had the highest intensity ($r = 0.40$) among non-procrastinators. The centrality measures showed similar patterns among both procrastinators and non-procrastinators. For procrastinators, self-esteem had the highest betweenness (2.247), while for non-procrastinators, self-efficacy had the highest betweenness (0.967). Self-esteem had the highest strength values among both groups, with 1.552 for procrastinators and 1.215 for non-procrastinators. The results of the NCT indicated that there were no significant differences in network structure across procrastination status ($p = 0.154$). Additionally, there were no significant differences in procrastination status in global strengths ($p = 0.263$). The network indices along with edge intensity are shown in Appendices S12 to S16.

Discussion

The present exploratory study sought to answer three main research questions (RQs): (i) what is the prevalence of procrastination among Iranians, and does it differ across different demographic features? (RQ1); (ii) can the variables of interest (self-efficacy, self-esteem, psychological distress, life satisfaction, emotion regulation, and the Big Five personality traits) be used to create profiles to distinguish procrastinators from non-procrastinators? (RQ2); and (iii) is there a key (central) variable that relates to procrastination when considering other variables simultaneously? (RQ3). Discussion related to each of these three questions is provided below.

Prevalence of Procrastination Among Iranians

The findings indicated a prevalence of 15.4% for procrastination. Other studies have reported the prevalence of chronic procrastination to range from 9.9% [50] to 20% [17]. In a study by Ferrari et al. [50], 11.5% of participants self-identified as arousal procrastinators and 9.9% as avoidant procrastinators. According to Ferrari et al. [44], self-reported rates of arousal procrastination among males and females were 13.5% and 14.6%, respectively. According to Harriott and Ferrari [17], 15%-20% of individuals exhibit chronic procrastination. The prevalence of procrastination among adults does not appear to have changed much over the past three decades, based on a comparison between the dates of the present study and those above. However, this prevalence estimation was much lower than the rate of academic procrastination among Iranian students, which, for example, has been reported to range from 29.2% [51] to 61% [52].

Prevalence Among Iranians Based on Demographics

Another finding was that the level of procrastination differed between genders, with female procrastination (17%) being considerably higher than male procrastination (13%). Some studies (e.g., [53, 54]) have reported that females are more prone to procrastination

than males. Possible explanations include females' higher anxiety levels [55] and fear of failure [56].

Nomadic individuals had the lowest prevalence of procrastination (9%) according to the association between where they lived and procrastination. There were no significant differences in the prevalence of procrastination among those living in rural areas, small or major towns. No previous research has been undertaken on the prevalence of chronic procrastination among nomads, and most research has examined urban and rural groups. Although the results of these studies are somewhat inconsistent, studies indicate that procrastination is more prevalent among those living in urban civilizations, which may represent the "rushing" and time urgency of urban life [1, 57]. Nomads had a lower tendency to procrastinate in the present study, which may be because of their lifestyle. Since they have limited resources and face seasonal migrations, they must complete their tasks on time. This may motivate them to finish their work promptly, as their deadlines are continually approaching.

Regarding educational attainment, those with a PhD or higher had the lowest prevalence of procrastination (9%), while there were no significant differences between those with academic and non-academic degrees. This result is consistent with earlier research findings indicating that those with a greater level of education report less procrastination [17]. Individuals with a higher level of education have likely learned to be more decisive [17] and have better time management due to their education.

Consistent with previous research (e.g., [17]), the highest prevalence of procrastination (23%) was observed among divorced individuals. This may be attributable to marital and interpersonal stress and the stresses of divorced individuals' post-separation lives. Moreover, the present study's findings indicated no significant changes in procrastination prevalence based on the number of family members, occupational status, or income level, suggesting that these three variables have little impact on procrastination in the studied sample.

Latent Profile Analysis Among Iranian Procrastinators

Comparing the profiles of procrastinators and non-procrastinators showed that procrastinators differed significantly from non-procrastinators on all the study variables investigated. Profile 1 exhibited moderate procrastination, with scores falling within the range of -1 to + 1. This aligns with Rozental et al. [23], who reported a category of "average procrastinators" among their five subgroups seeking treatment for procrastination. The present study's findings support the belief that procrastination is a common human behavior, but not everyone can be classified as a procrastinator [1]. This further suggests that individuals who do not exhibit some procrastination tendencies cannot be automatically classified as non-procrastinators. The following discusses the differences between procrastinators and non-procrastinators.

Self-efficacy and Self-esteem

Consistent with previous research (e.g., [58]), the present study's findings indicated that general self-efficacy was a significant predictor of procrastination and was a distinguishing characteristic between procrastinators and non-procrastinators. Self-efficacy refers to an individual's conviction in their ability to control conditions in achieving a goal, as such, it can influence their cognitive, motivational, emotional, and selective processes of behavior [59] and, consequently, the individual's efforts in all domains. Individuals with high self-efficacy do not avoid important steps, postpone work, or delay because they are

confident in their ability to accomplish a goal or task. On the other hand, individuals with poor self-efficacy avoid required steps, delay work, and procrastinate due to uncertainty in their abilities, pessimism, fear of failure, and worry [58]. In addition, non-procrastinators reported higher levels of self-esteem than procrastinators. This finding is consistent with numerous studies indicating a negative association between self-esteem and procrastination (e.g., [60]). Self-esteem is a general evaluation that individuals make based on their ideas and emotions, which defines their level of confidence in their abilities and sense of value and competence [61]. Regarding the direction of the relationship between self-esteem and procrastination, two perspectives have been provided. In the first, chronic procrastination is viewed as a means of self-protection for those with fragile self-esteem, whereas in the second, it is believed that low self-esteem leads to emotions of worthlessness, which in turn may result in task avoidance and failure [1, 4].

Psychological Distress and Life Satisfaction

The present study's findings demonstrated that procrastinators experience much more psychological distress than non-procrastinators. This result is consistent with several studies (e.g., [15, 24]). The relationship between psychological distress and problems that can increase procrastination, such as negative mood, insufficient attention to the future [62], lack of cognitive-emotional regulation, low flexibility [63], frustration intolerance [64], higher hopelessness, low flexibility, and anxiety, can explain the effect of psychological distress on procrastination. Moreover, high procrastinators may experience increasing psychological distress [65], suggesting the potential mutual relationship between procrastination and psychological distress, which can temper life satisfaction [15].

The present study found that non-procrastinators tended to have a higher level of life satisfaction compared to procrastinators. However, it is not as simple as stating that procrastinators have lower satisfaction levels due to their inability to meet deadlines. A meta-analysis of 43 studies by Sirois et al. [11] reported that procrastination was positively associated with an inability to enjoy satisfaction even after satisfactory performance. This is very important because it demonstrates that the reasons underlying the lower life satisfaction of procrastinators are not yet clear and require further exploration.

Big Five Personality Traits

In the present study, procrastination was positively associated with neuroticism and extraversion, which were higher in severity (i.e., mean scores) among procrastinators compared to non-procrastinators. The association between neuroticism and procrastination provides insight into the heightened levels of distress experienced by individuals exhibiting both neuroticism and procrastination. This is further compounded by neurotic behaviors such as perfectionism, which often result in self-criticism due to pursuing highly demanding goals. Consequently, such individuals may be more susceptible to procrastination, leading to greater levels of stress and anxiety [66].

A recent study's findings support the notion of a positive association between extraversion and procrastination [16]. This positive association, as well as the higher scores on extraversion among procrastinators, suggests a potential for arousal procrastination in the present study's sample. Research has shown that extraversion is positively associated with

arousal procrastination, which means that individuals tend to delay their tasks to experience the excitement or thrill of completing them at the last minute [67].

Procrastinators in the present study also scored significantly lower on openness, agreeableness, and conscientiousness than non-procrastinators. These variables were also negatively associated with procrastination. Based on these findings, and in line with the findings of Ocansey et al. [16], it can be concluded that individuals who do not procrastinate are more likely to be open to new experiences. Additionally, they tend to be agreeable and conforming individuals who take their responsibilities seriously and are dedicated to achieving their goals.

Network Analysis Among Iranian Procrastinators

The network analysis findings showed that although a set of variables helped distinguish between procrastinators and non-procrastinators, none were central, and all were peripheral in relation to procrastination when all were considered together. This is an important finding, given that merely relying on mean scale scores may be misleading when it comes to targeting a given variable for intervention. For instance, procrastinators scored higher on psychological distress and neuroticism and lower on self-esteem and self-efficacy. By analyzing the mean scores, a clinician may conclude that the aforementioned differences are indicative of procrastinators' vulnerabilities and may choose self-efficacy as a target for intervention. However, the network analysis findings suggested that such a perspective may not be appropriate as none of the aforementioned variables appeared to be stronger or more central to the network.

When considering the variables as a network, the findings indicated that psychological distress and neuroticism were more central among procrastinators, whereas psychological distress and self-esteem were more central among non-procrastinators. However, the observed differences were not significant. Also, self-esteem had the highest strength values among both groups, but the differences were not significant. Although none of the examined variables were significantly central or more important than the others, further analysis indicated that the examined network was gender-invariant (i.e., the observed patterns were the same across males and females, implying that none of the studied variables are potential candidates relating to the procrastinators' vulnerability or non-procrastinators' strengths).

As noted, only the analysis of mean scores offered backing for the TMT. However, as aforementioned, the variables' nature is fuzzy since they are interconnected, and all are simultaneously associated with procrastination without being separated in the real world. Consequently, the network analysis did not support any of the examined variables as a central variable in relation to procrastination. The understanding of the vulnerabilities is far from complete. Further research is required to examine other variables in terms of mean differences and network analysis simultaneously to determine which variables may be a candidate for vulnerability. Mediation analysis may not provide such insights. For example, Maria-Ioanna and Patra [15] reported that psychological distress mediated the relationship between procrastination and low life satisfaction, implying that tackling psychological distress might be a therapeutic intervention. Should network analysis be used, it may result in different findings. To gain a deeper insight into potential vulnerabilities, further network studies examining procrastination are needed.

Strengths and Limitations

In Iran, the majority of studies have addressed academic procrastination among student samples. Therefore, to address this shortcoming, an online survey was formulated to procure responses from a diverse range of participants from various regions of the nation. As previously noted, the present study is the first undertaken in Iran to establish the prevalence of procrastination among non-academic student samples and calculated prevalence estimates based on a variety of demographic characteristics (age, gender, marital status, education level, family population, living area, income level, and employment status). Furthermore, the large sample size and rigorous analyses are also strengths of the present study. However, it is imperative to acknowledge that each research study possesses its own set of limitations.

The findings of the present study may be constrained by the online convenience sampling method, which limits the extent to which they can be generalized to the entire population, particularly those who lack access to the internet. The present study estimated prevalence based on ring-curve distribution, where scores between -1 and + 1 were considered average. However, using such cut-off scores might increase type-II error, indicating that the findings should be interpreted with caution. However, it is difficult to differentiate levels of procrastination due to the lack of a standard cut-off value. As a result, z-scores [1, 44–47] or median scores [24] have been used to categorize procrastinators. It is also important to consider the limitations of self-report data because they are known to have methodological biases. These potential biases should be considered in addition to the aforementioned constraints.

Future Directions

Future studies could use the Pure Procrastination Scale [68] to estimate procrastination prevalence among Iranians, which considers avoidance, arousal, and decisional procrastination, potentially yielding different results [23, 24]. However, given the discussed limitations, it is necessary to develop a gold standard measure of procrastination to achieve more rigorous estimations. This can be done by creating an interview-based form, similar to the structured clinical interview for DSM-5 [69], which would determine pathological procrastination based on consensus between experts in the field. Using interview-based assessment in clinical settings would be a valuable tool for healthcare practitioners to attain a more precise and tailored approach to therapeutic interventions. By gathering detailed and personalized information directly from the client, clinicians can develop more accurate and effective treatment plans that address each individual's unique needs and challenges.

Future research could potentially examine individuals in Profile 1, identified in the analysis. More specifically, the underlying factors that contribute to the transformation of individuals with moderate procrastination scores (z-scores ranging between + 1 and -1) into individuals who exhibit procrastination tendencies versus those who do not. A more comprehensive exploration of nomadic individuals' exceptional lifestyles, values, or motivations could also potentially offer valuable insights due to the notably low prevalence of procrastination within this particular group. To gain a deeper understanding of how the Big Five personality traits can differentiate between individuals

who procrastinate and those who do not future research should employ a comprehensive approach that explores the various facets of these traits and their impact on procrastination tendencies. Such an approach would allow for a more nuanced investigation of the complex relationship between personality and procrastination. Moreover, as no study is available on the role of culture on procrastination in Iran, future studies should explore how Persian culture may play a contributory tole in procrastination among Iranians. Finally, longitudinal studies are important to elucidate the temporality of the findings and establish causality between the study variables examined here.

Implications

It should be noted that due to the cross-sectional design of the present study, any implications drawn are merely suggestive rather than definitive. To effectively address procrastination, it is paramount to customize the intervention to the psychological profile of procrastinators, given the unique concerns and challenges each faces [23]. This approach recognizes that procrastination is not a one-size-fits-all problem and requires a nuanced and personalized approach for successful treatment.

The present study found that the biggest differences between procrastinators and non-procrastinators were self-efficacy, psychological distress, self-esteem, neuroticism, life satisfaction, conscientiousness, openness, and agreeableness. The variations observed in the Big Five personality traits may not be a primary focus for therapeutic interventions. Nevertheless, a more in-depth analysis of these differences can facilitate the development of personalized treatment protocols. For instance, by prioritizing the improvement of self-efficacy, clinicians could evaluate the potential benefits for individuals with high neuroticism and low conscientiousness, such as procrastinators. Based on the findings, it appears that self-efficacy has the potential to serve as a valuable therapeutic target to initiate treatment. However, it remains unclear whether it is necessary to address self-esteem first, given its potential role in influencing self-efficacy. Further research is needed to better understand the relationship between these constructs in the context of procrastination and their respective implications for therapeutic interventions.

The efficacy of internet-based cognitive behavioral therapy (CBT) as a treatment for procrastination has been developed by Rozental et al. [70]. Evaluation indicates that such therapy effectively addresses self-reported problems related to procrastination, irrespective of whether or not the individual receives guidance from a therapist. Given the findings of the present study and earlier research [23, 24], it would be worthwhile to explore the use of this treatment in addressing procrastination among individuals with different profiles.

Conclusion

Procrastination is subject to individual variation and is associated with specific psychological profiles among both procrastinators and non-procrastinators. Furthermore, a distinct profile appears to exist for individuals who exhibit a moderate level of procrastination, indicating that not everyone falls into the binary categories of procrastinator or non-procrastinator. More specifically, some individuals may display a consistent tendency towards procrastinating or not procrastinating, probably based on situational factors. However, none of these variables could be considered as a potential vulnerability

among procrastinators because the examined networks were invariant across procrastinators and non-procrastinators, as well as across genders. Therefore, relying on the differences in mean scores on the various scales does not appear to be an optimal way of determining which variables are most important and may not help in intersecting vulnerabilities or therapeutic targets. These findings underscore the importance of understanding the nuanced nature of procrastination to develop effective interventions and strategies for individuals across the spectrum of procrastination tendencies.

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Declarations

Conflict of Interest None.

References

1. Ferrari JR. Still procrastinating? The no regrets guide to getting it done. New York: Wiley & Sons; 2010.
2. Steel P. The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. Psychol Bull. 2007;133(1):65–94. https://doi.org/10.1037/0033-2909.133.1.65.
3. Ferrari JR, Johnson JL, McCown WG, editors. Procrastination and task avoidance. Theory, research, and treatment. New York: Plenum Press; 1995.
4. Ferrari JR, Tibbett TP. Procrastination. In: Zeigler-Hill V, Shackelford TK, editors. Encyclopedia of personality and individual differences. New York: Springer Meteor Press; 2017. p. 1–8.
5. Orellana-Damacela LE, Tindale RS, Suarez-Balcazar Y. The impact of self-discrepancies on people's tendency to procrastinate. J Pers Soc Psychol. 2000;15:225–38.
6. Steel P, König CJ. Integrating theories of motivation. Acad Manag Rev. 2006;31:889–913. https://doi.org/10.2307/20159257.
7. Lord RG, Diefendorff JM, Schmidt AM, Hall RJ. Self-regulation at work. Annu Rev Psychol. 2010;61:543–68. https://doi.org/10.1146/annurev.psych.093008.100314.
8. Bailey 2nd JA. The foundation of self-esteem. J Natl Med Assoc. 2003;95(5):388–93. https://pubmed.ncbi.nlm.nih.gov/12793795.
9. Zulkosky K. Self-efficacy: A concept analysis. Nurs Forum. 2009;44(2):93–102. https://doi.org/10.1111/j.1744-6198.2009.00132.x.
10. Blunt AK, Pychyl TA. Task aversiveness and procrastination: A multidimensional approach to task aversiveness across stages of personal projects. Personality Individ Differ. 2000;28(1):153–67. https://doi.org/10.1016/S0191-8869(99)00091-4.
11. Sirois FM, Molnar DS, Hirsch JK. A meta–analytic and conceptual update on the associations between procrastination and multidimensional perfectionism. Eur J Pers. 2017;31(2):137–59. https://doi.org/10.1002/per.2098.
12. Viertiö S, Kiviruusu O, Piirtola M, Kaprio J, Korhonen T, Marttunen M, Suvisaari J. Factors contributing to psychological distress in the working population, with a special reference to gender difference. BMC Public Health. 2021;21:611. https://doi.org/10.1186/s12889-021-10560-y.
13. Pavot W, Diener E. The satisfaction with life scale and the emerging construct of life satisfaction. J Posit Psychol. 2008;3(2):137–52. https://doi.org/10.1080/17439760701756946.

14. El-Monshed AH, Loutfy A, Saad MT, Ali AS, El-Gilany H, Mohamed AS, Salah M, Zoromba M. Satisfaction with life and psychological distress during the COVID-19 pandemic: An Egyptian online cross-sectional study. PHCFM. 2022. https://doi.org/10.4102/phcfm.v14i1.2896.
15. Maria-Ioanna A, Patra V. The role of psychological distress as a potential route through which procrastination may confer risk for reduced life satisfaction. Curr Psychol. 2022;41:2860–7. https://doi.org/10.1007/s12144-020-00739-8.
16. Ocansey G, Addo C, Onyeaka HK, Andoh-Arthur J, Oppong Asante K. The influence of personality types on academic procrastination among undergraduate students. Int J Sch Educ Psychol. 2022;10(3):360–7. https://doi.org/10.1080/21683603.2020.1841051.
17. Harriott J, Ferrari JR. Prevalence of procrastination among samples of adults. Psychol Rep. 1996;78(2):611–6.
18. Nguyen B, Steel P, Ferrari JR. Procrastination's impact in the workplace and the workplace's impact on procrastination. Int J Sel Assess. 2013;21(4):388–99. https://doi.org/10.1111/ijsa.12048.
19. Rowhany N, Seyed Mousavi M, Gorji M, Samimi Z. The prevalence of procrastination among girl students and its relationship with demographic characteristics and virtual social networks. J Educ Stud. 2021;9(4):91–107.
20. Tavakoli M. A study of the prevalence of academic procrastination among students and its relationship with demographic characteristics, preferences of study time, and purpose of entering University. Educ Psychol. 2013;9(28):100–22.
21. Flett AL, Haghbin M, Pychyl TA. Procrastination and depression from a cognitive perspective: An exploration of the associations among procrastinatory automatic thoughts, rumination, and mindfulness. J Rational-Emot Cognitive-Behav Ther. 2016;34:169–86. https://doi.org/10.1007/s10942-016-0235-1.
22. Gustavson DE, Hatoum AS, Rhee SH, Kremen WS, Hewitt JK, Friedman NP. Genetic and environmental associations between procrastination and internalizing/externalizing psychopathology. Clin Psychol Sci. 2017;5(5):798. https://doi.org/10.1177/2167702617706084.
23. Rozental A, Forsell E, Svensson A, Andersson G, Carlbring P. Internet-based cognitive-behavior therapy for procrastination: A randomized controlled trial. J Consult Clin Psychol. 2015;83(4):808–24. https://doi.org/10.1037/ccp0000023.
24. Rozental A, Forsström D, Hussoon A, Klingsieck KB. Procrastination among university students: Differentiating severe cases in need of support from less severe cases. Front Psychol. 2022;13:783570. https://doi.org/10.3389/fpsyg.2022.783570.
25. Henrich J, Heine SJ, Norenzayan A. The weirdest people in the world? BBS. 2010;33(2–3):61–83. https://doi.org/10.1017/s0140525x0999152x.
26. Zhou Y, Cao C, Liu L, Liu Z, Liu J. Academic procrastination of nursing students in higher vocational college: Application of latent profile analysis and network analysis. Acta Physiol (Oxf). 2024;246:104296. https://doi.org/10.1016/j.actpsy.2024.104296.
27. Sergeant ESG. Epitools Epidemiological Calculators. Ausvet; 2018. Available at: http://epitools.ausvet.com.au.
28. McCown W, Keiser R. Adult inventory of procrastination (version 3.0). United States: Department of Psychology, University of Louisiana at Monroe; 2008. Unpublished manuscript.
29. Akbari M. The Persian version of Adult Inventory of Procrastination. Iran: Kharazmi University; 2022.
30. Mann L. Decision-making questionnaire. Flinders University of South Australia; 1982.
31. Hosseini F, Khayyer M. Prediction of behavioral and decisional procrastination considering meta-cognition beliefs in university students. Iran J Psychiatry Clin Psychol. 2009;15(3):265–73.
32. Song MK, Lin FC, Ward SE, Fine JP. Composite variables: When and how. Nurs Res. 2013;62(1):45–9. https://doi.org/10.1097/NNR.0b013e3182741948.
33. Sherer M, Maddux JE, Mercandante B, Prentice-Dunn S, Jacobs B, Rogers RW. The Self-Efficacy Scale: Construction and validation. Psychol Rep. 1982;51(2):663–71. https://doi.org/10.2466/pr0.1982.51.2.663.
34. Asgharnejad T, Ahmadi Dehghotboddini M, Farzad V, Khodapanahi M. Psychometric properties of Sherer's General Self-Efficacy Scale. J Psychol. 2006;10(39):262–74.
35. Rosenberg M. Rosenberg Self-Esteem Scale (RSES) [Database record]. APA PsycTests. 1965. https://doi.org/10.1037/t01038-000.
36. Shapurian R, Hojat M, Nayerahmadi H. Psychometric characteristics and dimensionality of a Persian version of Rosenberg Self-esteem Scale. Percept Mot Skills. 1987;65(1):27–34. https://doi.org/10.2466/pms.1987.65.1.27.
37. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess. 1985;49(1):71–5. https://doi.org/10.1207/s15327752jpa4901_13.
38. Maroufizadeh S, Ghaheri A, Samani RO, Ezabadi Z. Psychometric properties of the Satisfaction With Life Scale (SWLS) in Iranian infertile women. IJRM. 2016;14(1):57–62. https://doi.org/10.29252/ijrm.14.1.57.

39. Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther. 1995;33(3):335–43. https://doi.org/10.1016/0005-7967(94)00075-U
40. Sahebi A, Asghari MJ, Salari RS. Validation of Depression Anxiety and Stress Scale (DASS-21) for an Iranian population. J Devel Psychol. 2005;1(4):36–54.
41. Rammstedt B, John OP. Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. J Res Pers. 2007;41(1):203–12. https://doi.org/10.1016/j.jrp.2006.02.001.
42. Akbari M, Seydavi M, Zamani E, Nikčević AV, Spada MM. The Persian COVID-19 Anxiety Syndrome Scale (C-19ASS): Psychometric properties in a general community sample of Iranians. Clin Psychol Psychother. 2022;29(3):906–21. https://doi.org/10.1002/cpp.2686.
43. Byrne BM. Structural equation modeling with AMOS: basic concepts, applications, and programming (2nd ed.). Routledge/Taylor & Francis Group; 2010.
44. Ferrari JR, Díaz-Morales JF, O'Callaghan J, Díaz K, Argumedo D. Frequent behavioral delay tendencies by adults: International prevalence rates of chronic procrastination. J Cross Cult Psychol. 2007;38(4):458–64. https://doi.org/10.1177/0022022107302314.
45. Ferrari JR, Driscoll M, Diaz-Morales JF. Examining the self of chronic procrastinators: Actual, ought, and undesired attributes. Individ Differ Res. 2007;5:115–23.
46. Ferrari JR, Özer BU, Demir A. Chronic procrastination among Turkish adults: Exploring decisional, avoidant, and arousal styles. J Soc Psychol. 2009;149(3):402–8. https://doi.org/10.3200/SOCP.149.3.402-408.
47. Ferrari JR, Barnes KL, Steel P. Life regrets by avoidant and arousal procrastinators: Why put off today what you will regret tomorrow? J Individ Differ. 2009;30(3):163–8. https://doi.org/10.1027/1614-0001.30.3.163.
48. JASP Team. JASP (Version 0.17.2.1) [Computer software]. 2023.
49. Borsboom D. A network theory of mental disorders. World Psychiatry. 2017;16(1):5–13. https://doi.org/10.1002/wps.20375.
50. Ferrari JR, O'Callaghan J, Newbegin I. Prevalence of procrastination in the United States, United Kingdom, and Australia: arousal and avoidance delays among adults. N Am J Psychol. 2005;7(1):1–6.
51. Hayat AA, Jahanian M, Bazrafcan L, Shokrpour N. Prevalence of academic procrastination among medical students and its relationship with their academic achievement. Shiraz E Med J. 2020;21(7):e96049. https://doi.org/10.5812/semj.96049.
52. Karami D. Estimating the prevalence of procrastination and its association with depression and anxiety among students. J Thoughts Behav Clin Psychol. 2009;4(13):25–34.
53. Haycock LA, McCarthy P, Skay CL. Procrastination in college students: The role of self-efficacy and anxiety. J Couns Dev. 1998;76(3):317–24. https://doi.org/10.1002/j.1556-6676.1998.tb02548.x.
54. Paludi MA, Frankell-Hauser J. An idiographic approach to the study of women's achievement striving. Psychol Women Q. 1986;10(1):89–100. https://doi.org/10.1111/j.1471-6402.1986.tb00738.x.
55. Joubert CP. The relationship between procrastination and academic achievement of high school learners in North West province, South Africa. Doctoral dissertation, University of South Africa; 2015. Retrieved November 2, 2023, from: https://core.ac.uk/download/pdf/43177964.pdf.
56. Sabri Y, Hamdy I, El-Wasify M, El-Wasify M, Saleh ES. Causal attributions and executive functions of academic procrastination in Mansoura University students. Egypt J Psychiatr. 2016;37(2):70–8. https://doi.org/10.4103/1110-1105.193010.
57. Ferrari JR, Landreth N. "Guess I am a procrastinator": Self and other perceptions among rural U.S. citizens. N Am J Psychol. 2014;16(1):1–8.
58. Da Silva SP, Smith A, Facciolo M. Relations between self-efficacy and procrastination types in college students. Mod Psychol Stud. 2020;25(2):6. https://scholar.utc.edu/mps/vol25/iss2/6.
59. Bandura A. Perceived self-efficacy in cognitive development and functioning. Educ Psychol. 1993;28(2):117–48. https://doi.org/10.1207/s15326985ep2802_3.
60. Lipińska-Grobelny A, Bednarek K. Self-esteem and perfectionism versus procrastination. Q J Fides Ratio. 2021;4(48):484–95. https://doi.org/10.34766/fetr.v48i4.949.
61. Browne J. Self-esteem and procrastination in university students in barbados. CJP. 2016;8(1):14–24.
62. Sirois FM. Out of sight, out of time? A meta-analytic investigation of procrastination and time perspective. Eur J Pers. 2014;28(5):511–20. https://doi.org/10.1002/per.1947.
63. Eisenbeck N, Carreno DF, Uclés-Juárez R. From psychological distress to academic procrastination: Exploring the role of psychological inflexibility. J Contextual Behav Sci. 2019;13:103–8. https://doi.org/10.1016/j.jcbs.2019.07.007.

64. Dryden PPSW, Dryden W. Dealing with procrastination: An integrated CBT approach. London: Routledge; 2014.
65. Balkis M, Duru E. The evaluation of the major characteristics and aspects of the procrastination in the framework of psychological counseling and guidance. Educational Sciences: Theory and Practice. 2007;7(1):376–85.
66. Zhang X, Chen K, Wang M, Chen C. The relationship between academic procrastination and internet addiction in college students: the multiple mediating effects of intrusive thinking and depression-anxiety-stress. Psychol. 2022;13(4):591–606. https://doi.org/10.4236/psych.2022.134040.
67. Freeman EK, Cox-Fuenzalida LE, Stoltenberg I. Extraversion and arousal procrastination: Waiting for the kicks. Curr Psychol. 2011;30:375–382. https://doi.org/10.1007/s12144-011-9123-0.
68. Steel P. Arousal, avoidant and decisional procrastinators: Do they exist? Personality Individ Differ. 2010;48(8):926–34. https://doi.org/10.1016/j.paid.2010.02.025.
69. American Psychiatric Association DSMTF, American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Washington, DC: American psychiatric association; 2013.
70. Rozental A, Forsell E, Svensson A, Forsström D, Andersson G, Carlbring P. Differentiating procrastinators from each other: A cluster analysis. Cogn Behav Ther. 2015;44(6):480–90. https://doi.org/10.1080/16506073.2015.1059353.

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